Physician Response to the United Mine Workers' Cost-Sharing Program: The Other Side of the Coin

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The effect of cost sharing on health services utilization is analyzed from a new perspective, that is, its effects on physician response to cost sharing. A primary data set was constructed using medical records and billing files from a large multispecialty group practice during the three-year period surrounding the introduction of cost sharing to the United Mine Workers Health and Retirement Fund. This same group practice also served an equally large number of patients covered by United Steelworkers' health benefit plans, for which similar utilization data were available. The questions addressed in this interinsurer study are: (1) to what extent does a physician's treatment of medically similar cases vary, following a drop in patient visits as a result of cost sharing? and (2) what is the impact, if any, on costs of care for other patients in the practice (e.g., "spillover effects" such as cost shifting)? Answers to these kinds of questions are necessary to predict the effects of cost sharing on overall health care costs. A fixed-effects model of physician service use was applied to data on episodes of treatment for all patients in a private group practice. This shows that the introduction of cost sharing to some patients in a practice does, in fact, increase the treatment costs to other patients in the same practice who remain under stable insurance plans. The analysis demonstrates that

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when the economic effects of cost sharing on physician service use are analyzed for all patients within a physician practice, the findings are remarkably different from those of an analysis limited to those patients directly affected by cost sharing.

The political strategies of the 1980s that were intended to constrain the growth in health care expenditures have not met with complete success. Generally inspired by the economic theory of competition, specific policies to increase patient out-of-pocket costs have been influenced by research that shows that cost sharing reduces patient demand for medical care. Increased patient cost sharing continues to be offered as a partial solution to escalating medical care costs in the United States, and is also gaining acceptance internationally. However, no study has yet addressed the implications of patient cost sharing for physician treatment patterns.

Previous research has been limited to those patients directly affected by cost sharing, yet the complicated nature of the medical care market does not allow such precise segmentation. Indeed, it is the interaction of patient-initiated and physician-initiated utilization in response to changes in health care financing, such as increased consumer cost sharing, that offers more accurate policy implications for public and private health care strategies. It is rare, however, to find a "natural" setting for a demonstration project or other experiment that allows research of this interaction. The experience of the United Mine Workers of America (UMWA) beneficiaries and their providers offered a unique opportunity for such a study.

On July 1, 1977, miners and their families became subject to cost sharing after 25 years of full, first-dollar coverage by the UMWA Health and Retirement Fund. This new plan affected over 800,000 individuals. Immediately following the introduction of cost sharing, demand for physician visits decreased abruptly. Scheffler (1984) found that UMWA beneficiaries were 36 percent less likely to have one or more physician visits in the six-month period following the introduction of cost sharing. Providers whose market share included a substantial proportion of UMWA beneficiaries became vulnerable to new market forces.

These events have provided an opportunity to study the effects of cost sharing in two ways: (1) to study changes in the actual clinical management of patients who have become subject to cost sharing, hypothesizing that the changes are consequences of a shift in the patient utilization patterns faced by the physician; and (2) to study the clinical management of patients in the practice who were *not* subject to the introduction of cost sharing, hypothesizing that any change in the clinical management of this second group of patients might be due not to a change in their own utilization patterns, but to an attempt by physicians to compensate for changes in utilization by the segment of patients who became subject to cost sharing. Until now, no empirical study has examined the effects of cost sharing in this way.

Examining the UMWA cost-sharing experience from this perspective is relevant to current policy problems. Increased patient cost sharing has gained acceptance among insurers as one way of dealing with financial limitations on health care delivery. However, as each insurer remains a micro unit in the market, the direct intrainsurer effects of cost sharing on constraining costs may be misleading. Interinsurer effects must be understood as well; providers may simply shift costs across insurers. Thus, in the absence of a national health policy, the experience represented in this analysis offers a new perspective on the continuing problem of taking effective action to increase the efficiency and equity of health care delivery.

PREVIOUS RESEARCH

It has been well established in the literature that cost sharing significantly decreases patients' use of health services (Scitovsky and Snyder 1972; Roemer 1975; Helms, Newhouse, and Phelps 1978; Newhouse et al. 1981; Roddy, Wallen, and Meyers 1986). However, the effects of patient cost sharing on physician behavior are more difficult to assess. Previous research has been limited, for methodological reasons, to those patients directly affected by cost sharing. Provider response to cost sharing per se has not been the subject of investigation.

In the most comprehensive study on cost sharing to date, the RAND Corporation Health Insurance Study (HIS), the study population was only a very small proportion of the patients seen by any one provider (Newhouse et al. 1981). Consequently, the change in utilization faced by any given provider was negligible. This situation raises some question about the generalizability of the results when large numbers of patients within any given physician's practice are involved.

The theoretical motivation for questioning the generalizability of the RAND HIS results is the hypothesis of physician-induced demand. This hypothesis has attracted much attention among policy analysts (Evans 1974; Green 1978; Wilensky and Rossiter 1983; Auster and Oaxaca 1981; Hay and Leahy 1982; Hemenway and Fallon 1985;

Sloan and Feldman 1978; Reinhardt 1978). Simply put, the physician-induced demand hypothesis challenges the assumption of competitive market models that consumer "preferences" (needs and wants before taking price into account) ultimately determine patient "demand" (needs and wants after taking price into account). Instead, independent physician preferences (that is, those that would not be shared by the patient even if the patient were to have all the knowledge and information available to the physician) are believed to account for at least some of the demand for medical care. According to this hypothesis, physicians might be especially prone to induce or "shift" patient demand when threatened by an unwanted loss of income (Hadley, Holahan, and Scanlon 1979).

Researchers investigating the physician-induced demand hypothesis have frequently characterized the increase in the supply of physicians relative to the population as a possible threat to physician income (Dyckman 1978; Fuchs and Kramer 1978). Cost sharing also may pose such a threat. Cost sharing reduces utilization, and this, in effect, increases the supply of physicians in relation to patient demand. If physicians, threatened with loss of income following increased cost sharing among substantial numbers of their patients, respond by altering their practice patterns to maintain their incomes, the immediate effect of cost sharing in reducing patient demand may have little or no long-run effect on total medical care expenditures.

On one hand, the physician-induced demand hypothesis suggests that, as a result of cost sharing, practice patterns are likely to be altered in order to maintain physician incomes. More specifically, the pattern elements most likely to be altered are those treatment steps initiated by the physician, such as lab tests or hospitalizations, and fees. Least likely to be altered are actions initiated by the patient, such as ambulatory physician visits (Pauly 1980; Rossiter and Wilensky 1983). On the other hand, competitive market models predict that if physicians maintain a constant level of quality, they will only alter their practice patterns following cost sharing to reduce the financial burden to their patients who became subject to increased cost sharing. This can be done in a number of ways. One way is for physicians to increase the efficiency of their practice, either by eliminating unnecessary inputs into a treatment plan or by substituting less costly inputs. If physicians are already practicing efficiently, the competitive model predicts that they will lower their fees.

SETTING

The setting for this study is an established group practice, the Russelton Medical Group (RMG) of Miners Clinic, Inc., located in New Kensington, Pennsylvania. The total service area for the group practice covers approximately 200 square miles, stretching across parts of Westmoreland, Allegheny, Armstrong, Indiana, and Butler counties. This area is characterized by steel mills, foundries, and coal mining. Russelton Medical Group is one of several multispecialty group practices in rural Appalachian areas established largely through the efforts of members of the United Mine Workers Health and Retirement Funds (Taubenhaus and Penchansky 1968). RMG is a professional corporation that employs its full-time physicians on a salaried basis. The physicians receive no outside income, so financial risk to individual physicians hinges on the ability of the group to bring in sufficient revenue to meet the budgeted salary requirements of the individuals.

Mineworkers, steelworkers, and their families constituted over 80 percent of the patients seen by the RMG physicians. Steelworkers were privately insured by Blue Cross/Blue Shield and Metropolitan Life. Their benefits remained constant over the study period, 1976–1979. Following the introduction of cost sharing to the UMWA beneficiaries, average monthly visits to the group practice decreased by 13.5 percent. The major share of the decline was due to reduced utilization by UMWA-represented patients, whose visits decreased by 25.3 percent.

This setting has several advantages in a study examining how economic incentives influence physician behavior. First, the change in cost-sharing rates was an exogenous one, that is, it was beyond the influence of physicians. Second, the change that occurred was a large one, from no cost sharing to $7.50 per patient per visit. Third, physician membership in the RMG remained constant throughout our study period. And finally, miner and steelworker patients were fairly evenly distributed across physicians in the practice both before and after UMWA cost sharing. Thus, as a natural experiment, the experience of the RMG following the introduction of cost sharing to the UMWA offers a unique opportunity to study ways in which a substantial drop in utilization by one group of patients can affect physician treatment patterns for all patients in the practice.

METHOD AND DATA

Primary data for this study were collected both from clinic claims files and from medical record abstracts. In consultation with an expert advisory panel, measures of episodes of treatment were constructed and disaggregated into physician-initiated treatment characteristics and patient-initiated treatment characteristics (Fahs 1985). Ambulatory visits, whether initial or follow-up, were considered patient-initiated. Follow-up orders, diagnostic and therapeutic services, and hospitalizations were considered physician-initiated.

The study analyzes episodes of treatment for specific conditions. The conditions analyzed in this study are defined in terms of closely related groups of HICDA-II codes (given in parentheses):

- Diabetes mellitus (250.0–250.2)
- Urinary tract infection (599.5, 599.9)
- Tonsillitis, pharyngitis, and related streptococcal infections of the throat, to be referred to as "sore-throat conditions" (034.0, 462, 463)

Any patient having had at least one related service for the study conditions, as entered in the RMG billing file, in any of the three years of study was included in the study population (N = 11,785). Related services were defined by physician consultants to the study (SysteMetrics, Inc. 1983). The sampling design is a stratified probability sample. The stratification factors are three one-year time periods (one year preceding the introduction of cost sharing to the UMWA and each of the two years following), the three diagnoses, and whether the patient was a UMWA beneficiary or was privately insured (Blue Cross/Blue Shield or Metropolitan Life). This latter category is made up largely of steelworkers and their families. There are a total of 18 strata in this model.

A random sample of patients was selected within each strata until the target quota of approximately 125 patients per strata was reached. The sample size was reduced for two reasons: missing medical records (less than 4 percent) and losses after case screening. Case screening was necessary because the sample included many false-positive patients. For instance, patients who had received a blood glucose test were labeled with a diagnosis of diabetes, even if the test was used to rule out diabetes and the results were negative. Verification of the diagnosis from the medical chart was done by trained medical record abstractors according to objective criteria. These criteria were developed by physi-

Table 1: Patients in the Final Sample by Condition and Insurance Status

	Diabetes Mellitus	*Urinary Tract Infection*	*Sore Throat*	*Total*
UMWA	182	222	159	563
Non-UMWA*	159	181	186	526
Total	341	403	345	1,089

*Non-UMWA patient category is composed of Blue Cross/Blue Shield and Metropolitan Life beneficiaries.

cian consultants to the study and were reviewed by the group medical director (SysteMetrics, Inc. 1983). False-positive rates ranged from 30 to 50 percent. The final sample size is 1,089 cases. Table 1 presents the final sample size by diagnosis and insurance status.

The verification of diagnoses ensures a high degree of homogeneity within the sample. In addition, each patient visit was assigned a stage of illness by trained nurse abstractors whose work achieved 95 percent reliability based on a reabstraction of 10 percent of the sample and validation by an independent referee. Severity was classified according to a staging algorithm developed by Gonnella and modified by him for use in this ambulatory setting (Gonnella and Goran 1975). It is desirable to establish this level of disaggregation in anticipation of the argument that some patients cost more to treat because they are sicker.[1]

ESTIMATING EQUATIONS

Physician response to cost sharing is analyzed first by examining the total price (in constant dollars) of an episode of treatment one year before and two years after cost sharing. Physician-initiated treatment characteristics are then separated from patient-initiated treatment characteristics and examined separately. The seven equations to be estimated are specified below:

$$
\begin{aligned}
Y_{1\text{-}7} = {} & a_{1\text{-}7} + b_{1,1\text{-}7}\,(\text{AGE}) + b_{2,1\text{-}7}\,(\text{AGE}^2) + \\
& b_{3,1\text{-}7}\,(\text{Sex}) + b_{4,1\text{-}7}\,(\text{Insurance group}) + \\
& b_{5,1\text{-}7}\,(\text{New patient status}) + \\
& b_{6,1\text{-}7}\,(\text{Number of secondary diagnoses}) + \\
& b_{7\text{-}8,1\text{-}7}\,(\text{Stage of illness}) + \\
& b_{9\text{-}10,1\text{-}7}\,(\text{Primary diagnosis}) + \\
& b_{11\text{-}30,1\text{-}7}\,(\text{Managing physician}) + \\
& b_{31,1\text{-}7}\,(\text{Cost share}) + \\
& b_{32,1\text{-}7}\,(\text{Interaction term}) + e_{1\text{-}7}
\end{aligned}
$$

The dependent variables ($Y1-7$) include: (1) total treatment fees, including both hospital and ambulatory components, for patient-specific episodes of medical care; (2) total number of ambulatory physician visits per episode; (3) average fee per visit per episode; (4) average number of services per visit per episode; (5) average number of days between physician-recommended follow-up visits per episode; (6) total physician inpatient fees per episode; and (7) total inpatient days per episode. Precise definitions of the dependent variables ($Y1-7$) appear in the Appendix.

Three sets of independent variables are expected to influence the dependent variables that measure treatment characteristics: (1) patient characteristics; (2) physician costs for providing patient care services; and (3) changes in the UMWA cost-share provision.

Patients' demographic characteristics, obtained from the clinic's medical records, include age, sex, and type of health insurance. The degree to which the clinic is a regular source of care is captured by a variable that measures the number of visits made to the clinic in the six-month period prior to each study year. A 0,1 variable indicates whether or not the patient is new to the clinic.

Patients' medical characteristics include the study diagnosis; a measure of severity of illness, as averaged across all visits in the episode; and the average number of multiple diagnoses given the patient during visits in the treatment episode. Since additional diagnoses add dimensions to the physician's clinical management task, the number of multiple diagnoses serves as a measure of complexity.

In summary, patient "preference" for medical care is controlled for in this study by the patient characteristics of age, sex, type of health insurance, previous clinic visits, new patient status, diagnosis, severity, and complexity.

Cost factors that are exogenous to the physician group are held constant by deflating all fees according to the regional medical price index for the study years. In addition, possible differences in cost among physicians (due to training, experience, or practice style) are controlled for by including 0,1 variables that indicate each individual physician mainly responsible for the treatment episode.

A 0,1 variable representing the pre- and post-cost-sharing periods measures the general effect across all patients in the practice of introducing cost sharing to the miners and their families. Additionally, the differential effect of cost sharing between patient groups is measured by the interaction between cost sharing and insurance status. Definitions, measures, and data sources of the independent variables can be found in the Appendix.

REGRESSION RESULTS

The strategy used to relate the quantity and price of services chosen per episode of treatment to the independent variables is to estimate characteristics of the episode as a function of the exogenous variables in the physician's decision-making problem. This is analogous to a reduced-form estimation of a standard supply and demand model. Thus in the models, the dependent variables are regressed on the independent variables. In all the models, the treatment episode is the unit of analysis. In order to account for correlation of the error term with the independent variables (patients with higher levels of severity are expected to have wider variances in treatment expenditures), a logarithmic transformation is performed on the dependent variables, all of which are continuous. This transformation also reduces the influence of outliers in the right-hand tail. This is an effective transformation of the data because it achieves two objectives at once; it will help make the error terms more homoskedastic and at the same time will make the distribution of the independent variables more normal (Maddala 1977).

The models estimated are analysis-of-covariance models. In an analysis of covariance, the error term is composed of three components: a cross-sectional component, a time-series component, and a random component. Correlation is expected in the cross-sectional component and in the time-series component. In this study, however, patients were independently selected from each one-year time period and therefore the time-series component of the error term drops out. To the extent that cross-sectional correlation of utilization disturbances between patients is associated with having the same managing physician, the estimation of separate physician intercepts removes the cross-sectional component from the error term.

The remaining component of the error term is the random disturbance term. Accordingly, ordinary least squares (OLS) regression will provide unbiased, consistent estimated coefficients (Kmenta 1971). Since the regression residual analysis showed insignificant correlation effects, OLS estimates of coefficients are also efficient. By holding constant all factors that influence the covariance, including the effects that are associated with a given physician across patients, the models are also known as "fixed-effects" models.

All equations estimate utilization per episode before and after the introduction of cost sharing. The results are presented in the following order: (1) aggregate utilization; (2) patient-initiated treatment characteristics; (3) physician-initiated ambulatory treatment characteristics; and (4) physician-initiated hospital treatment characteristics.

AGGREGATE UTILIZATION

The regression results for the equation estimating the sum of both ambulatory and inpatient fees per episode before and after cost sharing are presented in Table 2. Overall, the equation performs well, establishing a good fit as indicated by the value of R^2 (.43).

Certain explanatory variables appear in groups—age with age squared; and severity stage II with severity stage III. It is useful to perform significance tests on these constructs for age and severity before looking at the significance of the individual variables. To test the hypothesis of "no effect" for the age and severity constructs, an F-test was performed on the hypothesis that the relevant parameters are jointly zero. Both the constructs for age and for severity are significant ($p < .01$).

Turning to the coefficients of primary interest to this study, we find that the parameter for insurance group (INSURE) is positive and significant ($p < .05$). This is consistent with competitive market expectations, where broader insurance coverage (the UMWA) implies increased utilization. The interaction term (CXI) behaves as expected, with a significantly negative effect on treatment price ($p < .05$). Inconsistent, however, is the significantly positive effect that cost sharing (COST) has on treatment price. Adding the coefficients of COST and CXI reveals that overall treatment price decreases (.06712 - .11136 = -.04424) for miners following cost sharing. In contrast, treatment price for nonminers (in constant dollars) increases.

However, we cannot infer from this price increase that cost sharing may have precipitated demand inducement on the part of physicians until we analyze separately specific physician-initiated and patient-initiated treatment characteristics. Equations further on disaggregate these treatment characteristics. The estimates of the coefficients for all variables are presented in Table 2.

PATIENT-INITIATED CHARACTERISTICS

Allowing that the decision to make or not to make a visit is under a patient's control (even if it is a follow-up visit), we next examine the effect of cost sharing on visits per episode.

Table 2: Regression Results (Coefficients for Covariance Model, Excluding Results for Physician Coefficients)

Independent Variables	Dependent Variables (LOG 10): *Total Fees*	*Total Visits*	*Average Fee per Visit*	*Average Services per Visit*	*Time between Follow-ups*	*Inpatient Fees*	*Inpatient Days*
Age	-.00176	-.00025	.00144	.00186*	.00471	.02389*	.02316
Age squared	.00004*	-.00001	-.00002	-.00002	-.00002	-.00012	-.00014
Female	-.01162	.00754	.01194	.02716**	.01867	.01520	.14435
New patient	.03459	-.03502	.04666*	.03225*	-.12183*	.07215	.16217
Prior visits	.02194*	.02055*	-.00074	.00121	.00019	.00197	.01603
Secondary diagnoses	.01273	-.02927*	.03469*	.01249*	-.01734	.01887	-.02925
Severity stage II	.20084*	.14322*	.01699	.01695	-.12780*	.00464	.07898
Severity stage III	.38255*	.12964	-.01212	-.02335	-.40048*	.15064	.08676
Diabetes	.38277**	.38270**	.00200	-.07505**	.79798*	—†	—†
Urinary tract infection	.18359**	.05904**	.09245**	.06091**	.57176*	-.13381	-.06948
Insurance market	.10285**	.04094	.08590*	.06951*	-.07655	.15902	.20384
Cost-sharing period	.06712*	.00640	.04682*	-.00148	-.11894	.17422*	.29242*
Insurance market × cost-sharing interaction	-.11136*	-.03117	-.06467*	-.05733*	.10029	-.36796*	-.40419*
(Constant)	1.12435**	.16673**	1.04483**	.17177**	.85426**	1.1187**	-.30775
R^2	.43	.48	.16	.13	.48	.31	.29
d.f.	1088	1088	1088	1088	387	112	112

*Significance level of .05 using a one-tailed t test.

**Significance level of .05 using a two-tailed t test.

†There were no hospitalizations for sore throat conditions; therefore, urinary tract infection replaces sore throat in the intercept term.

The results indicate that when total visits per episode is the dependent variable, neither insurance status nor cost sharing has a significant effect, but both severity and complexity are significant ($p < .005$). It appears from this equation that medical-need factors motivate patients to initiate physician visits, and that this medical need overpowers the negative deterrent of an increase in cost sharing.

PHYSICIAN-INITIATED AMBULATORY CHARACTERISTICS

The regression results for the first equation estimating physician-initiated characteristics of ambulatory treatment find a negative effect of cost sharing on visit fees (AVGFEE) for the miners (COST + CXI = -.01988). However, the statistically significant ($p < .01$) and positive parameter for cost sharing (COST) indicates that visit fees for nonminers have increased following UMWA cost sharing.

The next equation analyzes a measure of utilization—average services per visit (AVGSVC)—that is also controlled by the physician. Again, a negative coefficient is associated with the interaction variable. Miners, in relation to nonminers, are getting fewer services per visit following cost sharing. However, there is no effect on services per visit for nonminers following cost sharing. Thus, in this study, the positive effect of cost sharing on utilization seems applicable to ambulatory fees, but not to ambulatory "intensity" as measured by number of services.

The final equation for physician-initiated ambulatory treatment characteristics estimates the effect of cost sharing on the timing of recommendations for follow-up visits. This equation is estimated with only those observations having nonmissing values, resulting in a total of 387 degrees of freedom. The signs of the parameters must be interpreted here with caution. Since fewer days between follow-up recommendations (RECALL) means more (prospective) utilization, positive coefficients are now consistent with competitive market expectations. The coefficient for the interaction term (CXI) is positive, indicating that physicians increased the amount of time between recommended follow-up visits for miners (in relation to nonminers) after UMWA cost sharing. This finding is again consistent with the expectations of the competitive market model. The effect is not significant, however, due perhaps to the loss of degrees of freedom resulting from the frequency of missing data on this variable. However, the coefficient for the dummy variable indicating the introduction of cost sharing (COST) is negative and significant ($p < .10$). This parameter is inconsistent with the expectations of a competitive market model, and indicates that physicians shortened the time intervals between recommended follow-up visits for the nonminers after UMWA cost sharing.

Physician-Initiated Hospital Characteristics

In the last two equations, which estimate hospital characteristics of the episode, the results describe the effect of cost sharing on physician inpatient fees and length of stay (LOS). In the first equation, both coefficients for cost sharing (COST) and the interaction between cost sharing and insurance status (CXI) are significant ($p < .05$). The coefficient for CXI is negative and the larger of the two parameters in absolute terms, indicating that miners are subject to reduced inpatient physician fees following cost sharing. The parameter for COST is once again positive, and larger than any previous estimate. Average inpatient physician fees for nonminers increased significantly following cost sharing.

The results presented in the second hospital equation are similar. They indicate that the number of days spent in the hospital decreased for miners following cost sharing, while conversely, the number of days in the hospital increased for nonminers. These results also achieved statistical significance ($p < .01$).

Discussion

The results provide substantial empirical evidence consistent with the predictions of the physician-induced demand hypothesis. First, a positive effect on total fees per episode is found following the introduction of cost-cutting measures to the UMWA. This result is contrary to the predictions of traditional competitive market models. While the price of an episode of treatment for UMWA beneficiaries did decrease following the introduction of cost sharing, the price of episodes of treatment (in constant dollars) increased for other patients in the practice, holding constant the variables of age, sex, diagnosis, severity, complexity, new patient status, prior use, and physician characteristics.

The source of the price increase comes totally from physician-initiated characteristics of treatment, that is, from increased ambulatory fees, increased inpatient fees, and increased length of stay in the hospital. When patient-initiated characteristics—the number of visits made during an episode of treatment—are analyzed, the effect of cost sharing becomes statistically insignificant; while visits per episode decreased for UMWA beneficiaries following cost sharing, visits per episode for other patients in the practice were unaffected by UMWA cost sharing.

Physicians did, however, attempt to change visit rates following cost sharing by changing the time intervals between recommended follow-up visits. For the UMWA beneficiaries, these time intervals were increased. This behavior is consistent with the expectations of competitive market models. After out-of-pocket expenses to the UMWA beneficiaries increased, physicians recommended less frequent follow-up visits for miners than for nonminers. These recommendations would reduce the economic burden to the UMWA patient.

Yet for the other patients in the practice, follow-up visits were recommended at more frequent time intervals following UMWA cost sharing. The fact that actual visit rates per episode did not shift for these other patients is consistent with the predictions of physician-induced demand models. Physicians may be less able to shift utilization when that utilization is under the immediate control of the patient.

The two equations for hospital characteristics show the largest effects of the UMWA reimbursement change. Nonminer patients experienced longer lengths of stay and increased physician fees following the introduction of cost sharing to the UMWA. It is interesting that the measures of severity and complexity did not achieve significance in the hospital characteristics equations; this lack of significance is consistent with the hypothesis of a change in physician practice patterns following cost sharing. If, for instance, physicians hospitalized patients at different levels of severity before and after cost sharing, then severity would lose independent predictive power.

However, this result would also be true if patients requiring hospitalization were admitted at different levels of severity following cost sharing. A reasonable expectation is that miners might present at higher levels of severity following cost sharing, yet hospital fees for miners decreased. No change in behavior is expected on the part of nonminers. If, however, for some exogenous reason not captured in the model (such as a change in consumer expectations), nonminers presented at higher levels of severity following UMWA cost sharing than they did prior to UMWA cost sharing, then the higher fees would not be inconsistent with the traditional competitive model.

The univariate statistics indicate that the reverse is true. The average severity level for hospitalized UMWA beneficiaries decreased following cost sharing. The decrease in average severity level was even more pronounced for hospitalized nonminer patients. These findings suggest that physicians may have changed their practice patterns by admitting patients at lower severity levels after UMWA cost sharing than before, conforming with the expectations of the physician-induced demand hypothesis.

Thus, the results suggest that increasing cost sharing among large groups of patients may be less effective as a tool to reduce total health care expenditures than has been implied by studies that omit the effect of cost sharing on physician practice patterns. It appears from this analysis that compensatory actions will be taken by physicians following the reduction in benefits by a large insurance carrier. These findings are consistent with recent work documenting different clinical decisions in response to alternative financial incentives other than cost sharing among physicians in group practices (Hillman, Pauly, and Kerstein 1989).

In this study, cost sharing was introduced by one payer as a means of reducing its expenditures, but for other payers it appears that expenditures may have increased. Thus, the results suggest that in a world where insurance carriers are altering their benefits, other carriers must also adjust to avoid being the victim of cost shifting.

Whether or not the results can be generalized to other settings is an important consideration. Physician response to cost sharing is likely to be strongly affected by the reimbursement scheme followed. This particular physician group practice, with its long-term commitment to the provision of high-quality comprehensive primary care on a salaried basis, is perhaps less likely to consciously overutilize services than are physicians whose values are less well rooted in such a philosophical tradition. In other words, the results of this study may underestimate physician response to cost sharing in other, more traditional fee-for-service market settings. In contrast, the results may overestimate physician response in capitated reimbursement settings.

Furthermore, this is a study of a health care delivery setting in which one insurer has a large local market share. Changes in insurance provisions among carriers with small market shares may not be as likely to precipitate the cost shifting reported here. Finally, this study was conducted before the introduction of hospital prospective payment systems (PPS). The extent to which the hospital cost shifting reported here would take place in a hospital setting today is not clear. Yet the finding that physicians changed their practice patterns by admitting nonminer patients at lower severity levels remains a critical finding for policymakers concerned with designing efficient health care financing strategies.

CONCLUSION

The purpose of this study was to explore whether increasing the out-of-pocket price of medical care to patients offers significant tangible social benefits in the form of reduced treatment costs and increased efficiency of health production. The answer seems to be no, when two conditions are present: (1) when increased patient cost sharing significantly reduces the utilization levels experienced by physicians; and (2) when the cost-sharing increases do not apply in some uniform fashion to all patients in a practice.

Increased cost sharing did reduce medical care costs per episode for the targeted patient group, the UMWA. However, there were spill-over effects among the other patients in the practice. The incentives of the fee-for-service system, the income requirements of physicians, the relative insulation of the patient from medical care prices through insurance, and the relative isolation of patients from pertinent and personal medical information may combine to counteract the cost-containment efforts that are advanced in relative isolation from the rest of the health care delivery system.

For advocates of competitive market solutions to inefficiencies in the medical care system, the disappointing possibility of physician-induced demand appears unavoidable given the results of this and other studies (Roddy, Wallen and Meyers 1986; Rice 1983; Cromwell and Mitchell 1986). When considering increased patient cost sharing as a policy alternative, the results of this study suggest that policy analysts and health benefits managers should be sensitive not only to the direct effects of cost sharing, but also to the potential of opposing indirect effects—such as cost shifting—stemming from predictable noncompetitive physician behavior. A possible policy solution to this problem would be to base physician payments not on the number of services provided per patient, but rather on a prospective schedule of complete treatment fees for defined illness episodes, carefully adjusted for severity and complexity. National or state-based universal payer systems would offer another solution, regardless of payment method. Such single-payer systems would simply eliminate opportunities for noncompetitive interinsurer gaming in response to micro-market adjustments in cost-sharing rates.

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NOTE

1. The staging algorithm is a hierarchical classification scheme that uses strictly defined symptom gradations and combinations of diagnoses to classify a patient's severity level, working from known data about disease progression. Initially developed for inpatient classification, the protocols used in this study for each of the three conditions were modified and extended to incorporate variation seen in ambulatory patients. The individual protocols have been described elsewhere (Fahs 1985). In general, disease states are classified into three progressively severe stages: (1) diagnosis with no complications, (2) diagnosis with local complications, and (3) diagnosis with systemic complications.

APPENDIX

Variables, Definition, Measures, and Data Source

Variable	*Definition*	*Measure*	*Data Source*
Dependent Variables			
Total Utilization			
SUMFEE	Total fee per episode including both hospital and ambulatory fees	Dollars	Claims file
Patient-Initiated			
TOTVIS	Total visits related to the episode	Number of visits	Abstracted medical record
Physician-initiated ambulatory			
AVGFEE	Average fee per visit	Dollars	Claims file

Continued

Variable	*Definition*	*Measure*	*Data Source*
SVCVIS	Average services per visit	Number of services in visits related to the episodes; number of visits related to episode	Constructed variable
RECALL†	Average days to next follow-up recommended by physician	Time between follow-up recommendation and date of visit; number of visits per episode	Medical records and constructed variable
Physician-initiated hospital			
HOSPFEE‡	Total physician fees for hospitalization over an episode with hospitalization	Dollars	Claim file
HOSPDAYS‡	Total days in the hospital for an episode with hospitalization	Number of inpatient days	Abstracted medical record
<u>Independent Variables</u>			
Patient variables			
AGE	Patient's age	Years	Claims file
AGE^2	Patient's age squared	$(Years)^2$	
FEMALE	Sex	0 = Male 1 = Female	Claims file
INSURE	Insurance group	0 = Nonminer 1 = UMWA	Constructed variable
NEWPT	New patient status	0 = Continuing patient 1 = New patient	Constructed variable
PVISIT	Number of visits six months prior to the study year	Number of visits	Constructed variable
SEVI	Stage I severity level	0,1 (Intercept)	Abstracted medical record
SVEII	Stage II severity level	0,1	
SVEIII	Stage III severity level	0,1	

Continued

Variable	*Definition*	*Measure*	*Data Source*
SUMDX2	Sum of secondary diagnosis	1,4	Abstracted medical record
Physician variables			
DOCI-DOCXX	Managing physician	0,1	Constructed variable
COST	Introduction of cost sharing to 40 percent of the physician's practice	0 = Baseline 1 = Cost sharing	Constructed variable
CXI	Interaction of cost sharing with insurance group	(COST) ' (INSURE)	Constructed variable

*In the original data file construction, fee schedule fields containing zeros or missing codes were replaced by the first nonzero dollar figure appearing for that CPTCODE over the applicable six-month time period (defined by the intersection of the clinic fiscal year and the study time period year). Using that correction factor for missing values, no missing values remained.

†Outlying values of recall greater than 365 days were set to 365. This was true for only one observation where recall equaled 730 days. The regressions were estimated for this variable using only nonmissing observations (N = 388).

‡Statistics for HOSPFEE and HOSPDAYS are calculated for only the 113 patients with hospitalization during their episodes. In the regressions, means of HOSPDAYS are imputed to hospitalized cases with missing values shown here, by study year.

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